MAY, 1919.

ENTOMOLOGICAL NEWS

Vol. XXX. No. 5.

Thaddeus William Harris
1795-1856.

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PHILADELPHIA:
THE ACADEMY OF NATURAL SCIENCES,
LOGAN SQUARE.

Entered at the Philadelphia Post-Office as Second-Class Matter.
Acceptance for mailing at the special rate of postage provided in Section 1103,
Act of October 3, 1917, authorized on July 19, 1918.

ENTOMOLOGICAL NEWS

published monthly, **excepting August and September**, in charge of the Entomological Section of The Academy of Natural Sciences, Philadelphia, and The American Entomological Society.

ANNUAL SUBSCRIPTION, $2.00 IN ADVANCE.

SINGLE COPIES 24 CENTS.

ADVERTISING RATES: Full width of page. Payments in advance.

One issue,	one inch,	$ 1.20,	two inches,	$ 2.40,	half page,	$ 4.00,	full page,	$ 8.00
Five issues,	"	5.50,	"	11.00,	"	17.50,	"	35.00
Ten issues	"	11.00,	"	20.00,	"	35.00,	"	70.00

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FREDERIC DuCANE GODMAN.

ENTOMOLOGICAL NEWS

AND

PROCEEDINGS OF THE ENTOMOLOGICAL SECTION

THE ACADEMY OF NATURAL SCIENCES, PHILADELPHIA.

VOL. XXX. MAY, 1919. NO. 5.

CONTENTS:

Obituary—F. D. Godman..... 121
Weiss and Nicolay—Notes on Zeugophora scutellaris Suffr., a European Poplar Leaf-miner, in N. J. (Col.). 124
Braun—Descriptions of New Species of Coleophora (Micro-lepidoptera)... 127
Marchand—Collecting the Larvae of Tabanus and Chrysops (Dip.) 131
Aldrich—Leiomyza in North America (Dipt., Drosophilidae)..... .. 137
Gage—The Staining of Coccids (Hom.) 142
Editorial—Entomologia Resurgens Belgica 144
Wellhouse—An Itonid Feeding on Rust Spores (Itonididae, Diptera) 144
Entomological Literature 145
Review—Comstock's The Wings of Insects..... 148
Doings of Societies—American Entomological Society..... 150
Feldman Collecting Social (Coleop.) 150

Frederic DuCane Godman.

(Portrait, Plate VI.)

Dr. F. D. Godman, a founder and editor of the *Biologia Centrali-Americana* and a writer on butterflies, birds and other subjects in natural history, died February 19, 1919.

Two autobiographical notices of Dr. Godman have been published. One is in the second volume of the Jubilee Supplement of *The Ibis* for March, 1909; it is in the third person, either having been written by himself or compiled from notes furnished by him. The other, in the first person, is in the Introduction to the Introductory Volume of the *Biologia*, London, 1915. From them the present account is derived.

Frederick DuCane Godman, third son of Joseph Godman, of Park Hatch, Surrey, was born on January 15, 1834. He attended Eton College and Trinity College, Cambridge, but

before going to Cambridge he made a tour to Constantinople, the Black Sea and Greece, during which, deliberately emulating Leander, he swam the Hellespont to the Asiatic side.

It was in October, 1853, that he went to Cambridge, where, already interested in natural history, he soon became acquainted with Osbert Salvin and the brothers Newton, and together they made many ornithological and lepidopterological expeditions in the neighborhood.

In August, 1861, he and Salvin went to Jamaica, Belize and Guatemala, collecting birds, insects, plants and fishes. A trip to the Azores, in 1864, yielded a book (*The Azores,* 1870) on the natural history results of the expedition. In 1872 he visited the Canaries and Madeira to compare their faunas more critically with that of the Azores.

In 1878, he and Salvin matured their plans for publishing some connected record of their natural history experiences in Central America, the now well known *Biologia Centrali-Americana,* the first part of which appeared in September, 1879, and the last, the Introductory Volume, in 1915. In the summer of 1879 they, in conjunction with H. J. Elwes and W. A. Forbes, collected Alpine butterflies in the Dauphiné Alps. In 1886, he and Elwes collected plants, birds and butterflies in many parts of India and in Ceylon..

In 1887, he was recommended by his doctor to spend the winter in a warmer climate and so went by way of New York to Central and Southern Mexico, collecting material for the great work. He was accompanied by Mr. and Mrs. H. H. Smith, "who proved marvellously good collectors in various branches of entomology."

He was not only a collector himself, but also purchased many insects brought together by others, such as Lidderdale's North Indian, Bates' Amazonian and H. Druce's butterflies; Sallé's, Boucard's, Forrer's and Höge's Mexican and Central American Coleoptera, F. Bates' Heteromera, part of J. S. Baly's Phytophaga, Janson's Elateridae, and miscellaneous collections by Becker, Biolley, Blancaneaux, Conradt, Gaumer, Janson, Lankester, Morrison, Rhoads, Staudinger, Underwood, Van Patten, Wittkugel and others. Among those whom

he and Salvin employed for the collecting of insects and other specimens for the *Biologia* were G. C. Champion, H. Rogers, E. Arcé, W. B. Richardson, F. B. Armstrong, W. Lloyd and M. Trujillo.

All of these collections were subsequently presented to the British Museum of Natural History, of which Dr. Godman became a trustee. Some indication of their extent has been given in the NEWS for May, 1916, page 196.

From very early days Godman exhibited an intense love of sport—hunting, fishing, shooting and stalking; he often followed the hounds. He keenly enjoyed horticulture and he collected ceramic ware.

Oxford made him a D.C.L.; he was a fellow of the Royal Society, President of the Entomological Society of London (1891-2), and of the British Ornithologists' Union, etc.

His great contribution to biology is the series of volumes forming the *Biologia Centrali-Americana*, accounts of which have been given in the NEWS for December, 1905, and May, 1916, and we have expressed our appreciation thereof editorially in the latter number. It is not superfluous to recall here and now that, in conjunction with Salvin and others, he wrote the volumes on Lepidoptera Rhopalocera and on Birds, as well as a large part of the Introductory Volume; in the treatment of the Hesperidae he made much use of characters drawn from the male genitalia.

The most recent letter which the writer received from Dr. Godman is dated December 4, 1915, and reads, in part:

> Very many thanks for your kind letter of congratulations on the completion of the "Biologia." Of course, after so many years, I am glad to see it finished. Had it not been for the kind assistance I have had from the large number of contributors, nearly all of which has been gratuitous, it could not have been done.

As one of those contributors, with the recollections of nearly ten years of my early manhood largely devoted to a small part of the *Biologia*, I feel with the passing of Dr. Godman—whom, alas, I never met personally—as if a certain portion of my own life also had passed away.

PHILIP P. CALVERT

Notes on Zeugophora scutellaris Suffr., a European Poplar Leaf-miner, in New Jersey (Col.).

By HARRY B. WEISS and ALAN S. NICOLAY, New Brunswick, N. J.

This Chrysomelid, not heretofore recorded from New Jersey, was first observed in the State by Mr. Nicolay in a nursery at Arlington on June 23, where it was feeding on the foliage of poplar (*Populus deltoides*). It is a European species occurring in Middle Europe and also appears to be widely distributed in the United States. A specimen in the Schaeffer collection is labelled "New Mexico"; Mr. C. A. Frost writes that he has a specimen from Champaign, Illinois, and Blatchley in his "Coleoptera of Indiana" records it as rare in Starke and Wells counties. He further states that it was beaten from the leaves of hickory. In New Jersey we have found it only on poplar. Smith, in his list of the insects of New Jersey (N. J. State Mus. Report, 1909), mentions a related species, *Z. varians* Crotch, as being rare on poplar, and Blatchley also records this latter species from Indiana under similar conditions.

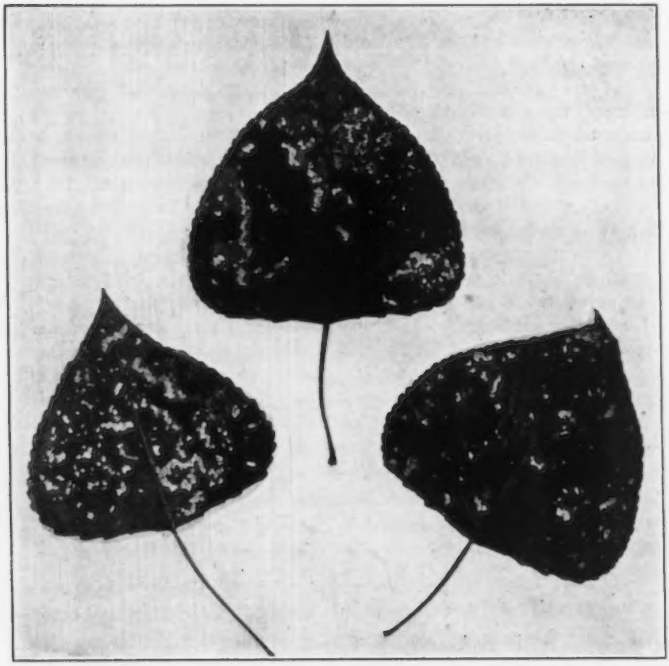
In New Jersey *Zeugophora scutellaris* is a feeder on poplar during its adult stage, and a leaf miner during its larval stages. It was very plentiful during the last week of June. The adults were active in the sunshine and when disturbed some would drop for six or eight inches, then recover and fly off. Many were observed in copula. The terminal leaves were preferred for feeding purposes and everything appeared to be eaten except the upper leaf surface and the supporting veins, even the smallest veins being left. The leaves were therefore skeletonized from the lower surface. Later, the upper leaf tissue and the veins dry and break, leaving irregular holes.

Eggs are deposited on the leaves and the larvae mine the tissue during July. By the first week in August many are full grown. They then leave the mines and drop to the ground in which pupation takes place, the adults appearing the early part of the next summer.

During the middle of September it was possible to find the yellowish, curved larvae from one to five inches below the

surface of the soil, most of them being at a depth of only one or one and one-half inches. Many of these larvae had been in the soil over one month and showed no signs of pupating. From this it seems likely that pupation takes place during the spring.

The larval mines are blackish, irregular and blotch-like,



Poplar leaves showing larval mines and adult feeding of *Zeugophora scutellaris*.

many of them extending over an entire leaf surface. They show more plainly on the upper surface, and as a rule only faintly on the lower. Usually a mine contained one larva, but in

a few cases two, and as many as four were found. The combined feeding and mining produces an injury which results in killing the foliage completely, most of it drying and falling to the ground. At Arlington the infestation was so severe that practically every leaf on four or five medium sized trees was infested.

Egg from dissected female. Length 0.6 mm. Greatest width 0.2 mm. Yellowish, oval, with broadly rounded extremities, one end slightly wider than the other, chorion smooth. Females collected on July 1 and dissected were found to contain from eight to thirteen well developed eggs and others in the process of development.

Full grown larva. Length 4-5.5 mm. Width, including tubercles, 1.7 mm. Color yellowish white, becoming yellowish when full grown, head and mouth parts dark. Body somewhat depressed, composed of 13 segments, apodous, anal end subtruncate. Sides of thorax and abdomen subparallel. Head with projecting mouth parts subtriangular, bearing median, dorsal dark line and several hairs. First thoracic segment flat, twice as long as second; second and third of equal length; first thoracic segment with faint, dorsal, transverse, foveiform impression. remaining thoracic and all abdominal segments except the last with transverse, undulating, impressed line on dorsal surface; lateral margin of first thoracic segment bearing two hairs; lateral dorsal portions second and third thoracic segments and each abdominal segment bearing two hairs arranged transversely. Abdominal segments subequal in length; sides of abdominal segments 1 to 8 produced into triangular tubercles, each bearing a hair. Ventral surface somewhat similar to dorsal, except that the lateral portions of the thoracic and abdominal segments bear only one hair. All hairs comparatively long, with somewhat tuberculate bases.

Adult. This was described by Suffrian in his paper "Fragmente zur genauern Kenntniss deutscher Käfer" (Entomologische Zeitung, zu Stettin, 1840), who gives *Populus nigra* as the food plant and the localities Aschersleben, Magdeburg and near Leipzig. The following description is from the original and from Blatchley's re-description:

"Elongate-oblong, convex. Black, except for the head, thorax, legs, pro- and mesosterna and the first three antennal joints which are clear yellow. Scutellum brownish. Thorax longer than wide, strongly convex, sides extended into prominent tubercles, surface coarsely punctate. Antennae stout, less than half the length of the body. Length 3.5-4.5 mm."

It is evident that the life history and habits of *Zeugophora scutellaris* are similar to those of *Z. flavicollis*. Kaltenbach, writing about this latter species in Pflanzenfeinde, 1874, p. 544, states that it occurs in Sweden and Germany on poplar, that the adults feed on the lower leaf surfaces and that the larvae are miners in the leaves of *Populus nigra*, the mines consisting of black spots on the upper surfaces. The larvae are legless, yellow with brown heads and flattened serrate bodies. Pupation takes place in the soil, the adults appearing in May of the following year.

We are indebted to Mr. C. W. Leng for supplying us with references to the foreign literature and to Mr. A. J. Mutchler, who, through the courtesy of Dr. F. E. Lutz, showed us this literature in the American Museum of Natural History.

Descriptions of New Species of Coleophora (Microlepidoptera).

By ANNETTE F. BRAUN, Cincinnati, Ohio.

(Continued from page 112.)

Coleophora polemoniella n. sp.

Head brown, palpi white, with a minute projecting tuft on the second segment, and marked with a brown streak along the outer side of the second and lower side of the third segment. Antennae with the basal, and three or four succeeding segments slightly thickened with scales; stalk whitish, annulate with brown. Thorax brown.

Fore wings golden brown, a distinct, rather broad white streak along the costa, fading out beyond the middle of the costa; a white streak along the fold nearly to the margin and broadest near the base; a white streak from the middle of the cell to its lower angle, broadest outwardly. Costal veins and one or two veins beneath the apex indistinctly marked with white. The spaces between these veins are shaded with dark brown, deepest toward the margins, but not extending into the cilia; the ground color above the discal streak is sometimes deepened. The conspicuousness of the white streaks varies; in some specimens all except the costal streak and the streak in the fold are almost indistinguishable. Cilia brownish, somewhat hoary along the costa. Hind wings dark grayish brown. Legs whitish, with a brown line along the outer sides. Expanse: 13-14 mm.

Locality: Cincinnati, Ohio, and vicinity. *Type* (a specimen showing all the marks described above) and paratypes in

writer's collection; paratypes in the Academy of Natural Sciences of Philadelphia and in the United States National Museum.

The larvae feed on the lower side of leaves of Greek valerian (*Polemonium reptans* L.), where they mine out the entire parenchyma, leaving silvery white patches. The mature case, of almost pure white silk, except where the overwintering grayer case marks its dorsal surface from mouth to one-half its length, is cylindrical, 9 to 10 mm. long with scarcely reflexed mouth, and with flattened, broadly expanded two-valved apex which is one and one-half times as broad as the maximum breadth of the case elsewhere. The apex is slightly asymmetrical, rather fish-tailed in shape. The mature cases were first observed April 16 and 18, and the larvae continued to feed for several weeks, pupating later on sticks and dead leaves near the food plants, where they are conspicuous because of their white color. Forty-two moths emerged from May 11 to June 2.

Mined leaves were collected June 13. The larva is yellow and makes a very fine whitish transparent thread-like mine, much contorted, which at last encloses in outline a slightly flattened ellipse,—that portion of the leaf which is to be cut out to form the first case. The portion cut out measures 2 mm. by 1 mm. This piece, in which the parenchyma is not consumed, forms the foundation for the case. It is folded, seam on under side and closely sewed together; it extends to the mouth of the case, but toward the apex, the case is made entirely of pale greenish silk, this silken portion projecting about half a millimeter beyond and of a slightly less diameter than the leaf part, and lacking the expanded apex of the mature case. Feeding ceases about July 1, when the case is about 4 mm. long, and is not resumed until early the following spring.

Coleophora ericoides n. sp.

Head grayish white; second segment of palpi fuscous outwardly, with a minute projecting tuft; third segment white, fuscous beneath. Antennae simple, whitish fuscous, indistinctly annulate beneath only.

Thorax and fore wings pale grayish ocherous. A rather distinct white streak along the costal edge to beyond the middle, where it blends

with the whitish costal cilia. White streaks usually indistinct and interrupted mark the course of the veins; of these the most distinguishable are along veins 11 and 10 and along the upper margin of the cell. A faint narrow line runs for half the wing length above the fold and parallel to it; another short line lies just below and alongside of the fold. A short streak sometimes runs through the outer half of the cell. The dorsal margin is narrowly white. Dorsal cilia concolorous with the wing. Hind wings grayish ocherous. Legs whitish, with the outer surfaces marked with brown. Expanse: 12 mm.

Locality: Cincinnati, Ohio. *Type* and six paratypes in writer's collection.

The larva mines the seeds and receptacle of a wild white aster (*Aster ericoides* L.). Numbers of the small seeds of the flower heads may be found eaten out presumably by the larva before making a case, or while the case is still very small. Later the mature case is attached to the surface of the receptacle and the larva mines into it, eating out the pithy central portion; one or two circular holes mark the point of entrance. The mature case is short, cylindrical, with three-valved apex, measuring 4.5 to 5 mm. in length, with a greatest diameter of 1.3 mm. The case is spun entirely of silk, in color varying from pale straw to brownish cinereous; it is more or less densely covered with pappus from the flowers, attached irregularly over the surface and extending backwards beyond the apex. It is thus difficult to discern in the ripening seed-head. The larvae are fully fed in the latter part of November and early in December may be found crawling or attached to stems and sticks in the neighborhood. The moths emerged September 17 to 28.

Coleophora amaranthella n. sp.

Head pale dull ocherous, palpi whitish, apex and projecting tuft of second segment fuscous. Antennae whitish, annulate indistinctly with brownish ocherous. Thorax whitish dull ocherous.

Fore wings pale brownish ocherous, the spaces between the veins reaching the costal edge white, more or less densely dusted with fuscous; beneath the apex the ground color is irregularly sprinkled with white and fuscous scales. A white dusted streak extends through the cell, starting faintly near the base and broadening outwardly and ends at the lower angle of the cell in a rather conspicuous fuscous spot. A dusted white streak along the fold and another along the dorsal margin. Hind wings pale grayish ocherous. Legs whitish with a fuscous

line along the outer surfaces; tarsi fuscous. Abdomen whitish beneath, grayish ocherous above. Expanse: 13 to 14 mm.

Locality: Cincinnati, Ohio (probably widely distributed with its food plant.) *Type* and paratypes in writer's collection; paratypes in Academy of Natural Sciences of Philadelphia and in the United States National Museum.

Twenty-eight specimens reared from larvae eating out the seeds of pigweed (*Amaranthus hybridus* L.). Mature case 6 mm. long, subcylindrical, with mouth slightly bent over, thickest just behind the middle whence it tapers slightly before flaring to form the three-valved apex. It is spun entirely of rough brownish silk decorated with numerous irregular, small, buffish gray particles. The larvae feed throughout the autumn and remain during the winter hidden among the old flower clusters. Imagos emerged from July 27 to August 23.

The fuscous spot near the lower angle of the cell is the distinguishing characteristic of this species.

Coleophora granifera n. sp.

Head whitish, ocherous above; palpi dark fuscous on the outer sides; antennae whitish, with the basal segment enlarged with scales near the extreme base. Thorax whitish ocherous.

Fore wings with the white color predominating, so that the ground color may be regarded as white with ocherous streaks. Costal edge, for one-third its length ocherous, extreme costa near the base fuscous. There is sometimes a very small ocherous streak near the costa, just proximal to vein 11; ocherous streaks lie in the spaces between the remaining costal veins, and the apex of the wing is ocherous. An ocherous streak extends from near the base through the upper half of the cell and runs into the apex. There is sometimes an ocherous streak through the lower half of the cell, running into the ocherous outer margin of the wing. This may be as distinct as the other discal streak or entirely wanting except near the outer margin. An ocherous streak from the base below the fold usually reaches the wing margin. There is sometimes faint fuscous dusting, especially in the apex and along the costal ocherous streaks. Cilia ocherous and white intermixed. Hind wings pale grayish ocherous to fuscous, usually darker than the fore wings. Legs whitish, fuscous outwardly. Abdomen whitish beneath, fuscous in the mid-dorsal line. Expanse: 12.5-14 mm.

Locality: Cincinnati, Ohio. Type and paratypes in writer's collection.

The cases are found on the under side of leaves of *Aster shortii* Lindl. The nearly full-grown larvae with mature cases feed on the lower leaves near the ground in early spring. The mature case is about 10 mm. long, cylindrical, with mouth slightly deflexed and with two-valved slightly expanded apex. It is spun of brownish red silk, paler toward apex, with a dark brown granular spot on the upper side beneath the mouth. The larvae continue to feed until the middle of May, and produce moths from June 2 to July 10. Eleven specimens reared; two captured.

Leaves mined by the larva before constructing its first case, were collected in the latter part of June. This mine is irregular, sometimes trapezoidal in shape, and is several times the area of the first few mines made after the larva spins its minute case, which is covered closely toward apex with the black frass taken from the mine. These mines extend in a curve across the leaf, gradually increasing in size. The case is gradually elongated at apex and mouth and increased in diameter by the splitting open and filling in of the under surface with silk. These additions are pale gray at first, later becoming reddish, and the original frass-covered case forms the dark brown patch on the upper side of the mature case. During late summer and fall, the larvae mine the small leaves up amongst the inflorescence.

The imagos of this species, particularly the paler specimens, are only with difficulty distinguished from those of *C. vernoniaecella* Chambers, in which the position and course of the markings are practically the same. The latter species is larger and paler, with the outer margin mostly white, instead of ocherous.

Collecting the Larvae of Tabanus and Chrysops (Dip.).

By WERNER MARCHAND.

(From the Department of Animal Pathology of The Rockefeller Institute for Medical Research, Princeton, New Jersey.)

While the larvae of mosquitoes and many other Diptera Nematocera are comparatively well known, as they are aquatic in habitat, and while the larvae of many Brachycera have been

frequently reared from all sorts of decaying material, the mud-inhabiting larvae of the Tabanidae have received but scanty attention from entomologists. Yet the Tabanidae constitute a family of wide distribution, rich in species and abundant in individuals. They are therefore entirely worthy of the attention of the scientific dipterist. Moreover, the Tabanidae represent a considerable source of trouble to cattle and live stock, being so numerous in some localities as to be seriously disturbing.

The large black horseflies have been noticed by most of us. The "greenheaded" flies are a serious and well-known pest, especially in the region of the shore. In certain regions in the South Tabanidae are so numerous that they are especially mentioned by travelers, and particular regions have their particular flies. Some species, for instance those of *Chrysops* and *Diachlorus* ("the yellow fly of the Dismal Swamp") will attack man freely and inflict painful bites. These flies are also very common in New Jersey, sixty-five species having been listed.

The reason why apparently the larval stages of these flies have been very generally overlooked lies in the fact that they inhabit the wet soil in the immediate neighborhood of water. In other words, they are not taken by the ordinary collecting methods of the fresh-water-exploring entomologist, since, for the purpose of taking water insects, usually a net is employed, and the taking of much mud into the net is carefully avoided. The Tabanid larvae are never, or only in very young stages, found submerged under water, hence they are never taken with the fishing net.[1] On the other hand, the land-collector will

[1] This statement apparently has to be modified. That Tabanid larvae may be found occasionally submerged, at least in the fall, possibly in preparation for passing the winter, is a fact which I owe to Dr. Robert J. Leavitt in Trenton who, in October, 1918, took three half-sized larvae of *T. atratus* in mud (or water), while dredging with a net for tadpoles and sunfish in water eight or ten inches deep, over mud in which grows a characteristic mud vegetation. The locality was a pond on a dairy farm near Trenton Junction. The three larvae were taken in

examine vegetation, bark and stumps of trees, heaps of dead leaves, or whatever is found underneath stones; he will occasionally proceed to sifting, but in this case, of dry material. He will not examine, as a rule, the wet soil adjoining water; therefore he will take Tabanid larvae only occasionally.

These larvae are, however, almost invariably present in the soil immediately above water, at the edge of brooks, ponds, lakes and streams, small springs and water holes; in short, almost any kind of permanent body of water. They may be

three different dips of the net and always at two or three feet distance from shore. There was no possibility that they came from anywhere but in or under the water.

Tabanid larvae of various species have been taken by myself in the mud of the edge, not submerged, in the months of September, October, November and February when the weather was mild, but it is possible that they are able to pass the cold periods of the winter below the water since, according to my experience, they apparently do not stand much freezing; on the other hand, their need of oxygen is not as great in winter as in summer. That the very young stages of many species (*Chrysops*) undoubtedly live submerged, has already been stated; those stages may derive oxygen from submerged plants (algae, etc.).

I notice that H. H. King (Report Wellcome Tropical Research Laboratory, Bulletin of Entomological Research, Vol. 1, Part 4, December, 1910, page 265.) has stated of the larvae of the African *T. ditaeniatus*, that they were found submerged in a small water channel, the water of which was overgrown with a covering of green slime and if this was cleared away, a few larvae could generally be seen at the surface. "On stirring the mud at the bottom and edges of the water," says King, "more would appear, while if one waited for an hour or so, specimens would continue to rise. They were apparently living at the bottom of the pools and coming periodically to the surface to breathe. They could be seen rising to the surface by a lashing motion, and if left undisturbed would, after a few seconds, sink out of sight again."

Certain species of Tabanidae live, as larvae, under stones in shallow, rapid-flowing water, notably *T. kingi* (King) and *T. vivax* (Hine). The latter species may be taken if a sieve is held so that as a stone is being lifted, the larvae under it are swept into the sieve by the current (Hine).

These exceptional cases should be taken into consideration by collectors, but, on the whole, the rule holds good that Tabanid larvae are found in the soil and mud immediately above water and near the edge, as hundreds of captures have demonstrated.

most easily obtained by means of a wire kitchen strainer six inches in diameter and of medium size mesh, with strong handle. These strainers are used in households and can be furnished by any hardware store. In sifting for the larvae, a lump of mud the size of a fist or larger is taken from the edge of the water and placed into the strainer. The latter is then gently shaken, at the same time immersing it in the water near the edge. The earthy constituents are washed through the wire meshes and the Tabanid larvae become visible. This process is repeated until it gives positive results, which is nearly always the case within less than half an hour. If the larvae are not found readily in one place, they will often be present in another place only a few feet distant. It is often found convenient to seize bundles of sod by the roots and shake them with water in the strainer until the earth is washed off. Frequently the larvae are found clinging to the grass roots. Wherever soft mud is exposed to the surface directly adjoining the water, it should be put through the strainer and it will usually contain some larvae. Even sandy and muddy banks without any vegetation will frequently yield an abundance of larvae of *Tabanus* and *Chrysops*. At ponds where a rich green vegetation of *Lemna* and aquatic weeds is present, the half-decaying masses which border the edge of the mud underneath may contain larvae. Brooks with coarse sand or gravel are not favorable because the coarse sand does not pass through the meshes of the strainer and therefore the larvae are often overlooked or injured. Generally, the larvae are located only a few inches from the surface, but may be found to a depth of one foot, and in some localities even deeper. In places where the water has receded, owing to dry weather, the larvae will often follow the receding water and be found at the new edge, but if the ground retains some moisture they may be looked for all over the formerly inundated region. Ponds or brooks with a definite permanent border give better results than indefinitely bordered swamps, wet meadows, etc. One has always to bear in mind that the larvae are air-breathers and as such may scatter in swampy regions with low water level over wide areas, while in all localities where the water maintains a certain level,

they are forced to aggregate at the borders. On the other hand, being dependent on moisture, they do not usually go any great distance away from these borders.

It is not difficult for the entomologist to identify the Tabanid larvae as such. The larvae are nearly always cylindrical in shape, whitish, grayish or yellow in color, and characteristically hard and firm to the touch. This is due to their strong chitinization and their contraction at the moment when they are taken. They generally will soon begin creeping and then will appear more slender and more pointed at the cephalic end. The small larvae of *Chrysops* are usually taken when between 5 and 10 millimeters long; the smaller ones escape attention. The *Chrysops* larvae are whitish or greenish yellow, the end of the abdomen often darker. The *Tabanus* larvae are found in all sizes from 5 to 45 millimeters, more frequently, however, of the medium size. They are usually whitish, yellowish or reddish grey, either without pattern and shiny, or with gray or brown transverse markings. In all larvae the proleg-bearing ridges may be quite conspicuous. The larvae of most species do not float at the surface but sink to the bottom of the water; certain species as, for instance, *T. lineola* and *T. atratus*, have inflated tracheae and float at the surface when washed out of their habitat. This facilitates their capture, and in places where these larvae alone occur, a strainer is not necessary. All that is needed is to throw lumps of mud and sod, grass, bushes, etc., from the edge into the water, stir them and work them over for a while and the larvae will soon rise to the surface where they betray their presence through vigorous wriggling or lashing movements.

Together with the Tabanid larvae, one may obtain, by means of the strainer, the larvae of other Dipterous families, chiefly Dolichopodidae, Leptidae and Tipulidae. The former two families comprise larvae usually of the size of *Chrysops* larvae but more slender, shiny white or yellowish, the end of the body not pointed or rounded but truncated or ending in several lobes. The Tipulid larvae, when belonging to larger species, are generally gray or blackish in color; those belonging to

smaller species may be yellow, white or greenish. All Tipulid larvae are distinguished from Tabanid larvae by being quite soft to the touch, with no well-marked circular annuli.[2]

Tabanid larvae can be taken at all times of the year; certain species seem to have a preference for definite localities where they are regularly present while other equally common species are absent, having their breeding-places elsewhere. It is therefore possible to obtain breeding material of definite species at all seasons provided a good breeding locality has been found. But some species are found pretty nearly everywhere. Late fall, winter and early spring are favorable seasons for collecting, as the presence of vegetation is not as interfering as in summer.

When collected, the larvae should be placed with wet plant material, and then should be isolated as soon as possible, as they will proceed to eat one another in a very short time. Each larva ought to be placed into a glass vial. The writer uses test-tubes with lip, and lined with filter paper, but small, so-called homoeopathic vials answer the purpose perfectly well. For moisture, a lump of plant material, or wet filter paper, blotting paper and the like should be placed in the bottle. The neck should be covered with cheesecloth or linen. Instead of string, rubber bands may be very conveniently used. If the bottles have no neck or lip the larvae will frequently escape, as they are able to force their way through almost any passage. As food, small earthworms, or pieces of such, or small pieces of raw meat, can be given,[3] but the larvae can do without food for a long time if kept moist, since they are very hardy. In this condition the larvae are ready for mailing; a number of such bottles or vials, with locality labels attached to them, can be packed in cotton and shipped any distance.

It is to be hoped that collectors stationed in localities where

[2] The larger Tipulid larvae are found more abundantly among decaying leaves, grass roots, etc., in the edge of the water than in the mud itself.

[3] I notice that larvae of *T. atratus* take boiled as well as raw meat. If boiled meat is given, care should be taken that it is not salted, as in this case the larvae would probably not accept it.

Tabanidae are numerous and where species occur, the larvae of which are not known at all, will utilize their opportunity for the sake of entomological science, and kindly send such material to the specialist. The systematic study of the larvae of Tabanidae is not only of direct interest for the classification of the flies of this family, but is also of great importance for our understanding of Dipterous larvae in general and of their phylogeny.

A few words might be added with reference to the pupae. The Tabanid larvae pupate in their normal habitat, in wet soil, near the surface, and the pupae are not infrequently found in the strainer, though, owing to the shortness of the pupal period as compared with the larval stages, they are not nearly so commonly found as the larvae. The small pupae of *Chrysops* are about 10 mm. long and brownish or grayish yellow in color. The *Tabanus* pupae may be much larger, and of grayish, greenish or fuscous coloration. The pupae of both genera look much like Lepidopterous pupae, having, however, the abdominal segments bordered with narrow fringes of spiny bristles; by means of these fringes the pupae work their way to the surface when the water rises, and when the fly is about to hatch. If placed on moist, but not too wet, ground the pupae will usually hatch within less than two weeks. The pupal shells should be carefully preserved together with the fly which emerged from them. If the larval skin is still present, it should be placed in alcohol; the exuvia is often all that is necessary for a description of the larva.

Leiomyza in North America (Dipt., Drosophilidae.)

By J. M. Aldrich, U. S. Department of Agriculture, Bureau of Entomology, Washington, D. C.

Historical.

Leiomyza was proposed by Macquart in 1835 for Meigen's *Agromyza glabricula* and *laevigata*, which, as Macquart observed, differed too much on the absence of vibrissae and of anterior frontal bristles to remain in *Agromyza;* he also men-

tions approximated crossveins and the forward curvature of the fourth vein as generic characters, but the former of these proved to be a mistake.

Meigen in 1838 accepted the genus and added a third species, *Heteroneura scatophagina* Fallen, which he had himself previously referred to *Agromyza*. He figures *glabricula*, but the venation is not quite alike in the two wings, and he shows a full complement of basal cells which afterward proved an error. He mentions as generic characters only the absence of bristles on the anterior part of the front and the course of the fourth vein.

Westwood in 1840 placed *Leiomyza* as a subgenus of *Agromyza*, defining it in a few words and repeating Macquart's error about the approximation of the crossveins; he mentioned *scatophagina* as "typical species," although he probably had no thought of giving it any taxonomic prominence above the other two by so doing. As it was not originally included, it could not be the type species in a modern sense.

Zetterstedt in 1848 gave the best description of the genus yet published, evidently drawing the characters from Fallen's type of *scatophagina*, which he also redescribed; he also designated this species as "*Typus generis.*"

Schiner in 1864 was unable to give a satisfactory account of the genus, his only material being a determined specimen from the Haliday collection and one from Winnertz, which were obviously not congeneric, yet both resembled the descriptions. We can now decide that Winnertz was right, but Schiner could only adapt the earlier descriptions after a fashion, leaving the genus more confused than before.

Rondani never attempted to place the genus.

Becker cleared up the matter very much in 1902 by publishing the characters of the specimen standing as type of *laevigata* in the Meigen collection, with a figure of the venation. This specimen has the characters assigned by Meigen to the genus, but specifically agrees better with *glabricula*, as it has yellow halteres and the hind femora not black at tip. The *glabricula* type, or supposed type, is preserved with it but is now headless. It has the same wing characters and is un-

doubtedly congeneric. Becker makes the genus out as a perfectly good one, differing from *Asteia* chiefly in having a hind crossvein and a longer (normal) second vein, and he places it in Drosophilidae next to that genus. From the material (North American) that I have seen, I entirely agree with this; we have a genus still more nearly related. *Sigaloessa*, which possesses a hind crossvein, hence differs hardly at all except in its greatly shortened second vein.

Czerny in 1903 gave some notes on a speciment of *scatophagina* in Zetterstedt's collection, including additional generic characters. This species is strictly congeneric with the other two, if not in fact an earlier name for *glabricula*. Meigen in the original description of *laevigata* suggested that it might be only a variant (Abänderung) of *glabricula*. As no valid designation of a genotype has been made, *glabricula* is hereby designated.

Williston in 1896 (a) reported the genus from North America and placed it in his table of Agromyzidae (1896b); but in 1908 he omitted it, evidently not satisfied with his identification.

Melander in 1913, in his exhaustive treatment of Agromyzidae and related families, mentions *Leiomyza* as a genus unknown to him.

Lorenz Oldenberg in 1914 gives generic characters from numerous specimens and from Becker and Czerny. He finds the flies in the forest in Germany on exuding sap of trees, on tree fungi, and on boards in the sun. His specimens show considerable variation in the amount of infuscation of the front, antennae and femora, but seem to agree with *laevigata*.

With this historical review, I proceed to a description of the genus and two new North American species.

Generic Characters.

Head nearly hemispherical, concave behind, the eye very large, bucca and parafacial extremely narrow. Antennae ordinary, inserted at about the middle of the head in profile, arista bare or slightly pubescent. Face short, not carinate; a minute pair of vibrissae present. Front and face of equal width, less than one-third that of head; front flat, smooth, or-

bits more or less differentiated above for a short distance, and shortly above antennae with a transverse depression. Two pairs of verticals, one of frontals, which are at the level of the median ocellus. Post-verticals absent (in ours, said to be divergent by Oldenberg).

Thorax and abdomen in all the species black and highly polished. Chaetotaxy of thorax: dc 1, npl 1, stpl 1, sc 1 (and a very minute lateral pair, apparently absent in the female of *slossonae*); acrostichals in the North American species a very delicate single row of hairs, laterad of which the surface is entirely bare to another row in the dc line. Wing as figured, second basal and anal cells wanting, fourth vein gently curved forward from near the crossvein, so that the first posterior cell is about two-thirds as wide at apex as near its base.

Table of North American Species.

Front and hind femora distinctly stouter than middle ones
slossonae n. sp.

Front and hind femora of about the same diameter as the middle ones
melanderi n. sp.

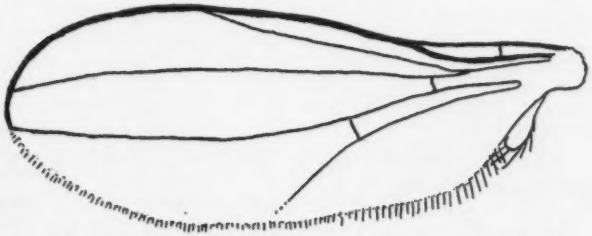
Leiomyza slossonae n. sp.

Front brown, including an extension to the vertex on each side of the ocelli; ocellar triangle and the upper third of frontal orbits shining black; lower edge of front yellow; antennae yellow, third joint, oval, slightly infuscated or not on upper edge; arista microscopically pubescent, appearing bare under hand lens. Face, parafacials and bucca almost white, sometimes more yellowish, with a narrow brown line usually perceptible separating the first two and bordering the sides of the mouth cavity. Palpi yellow; proboscis small, yellow. Halteres yellow. Legs including coxae wholly yellow except last tarsal joint, which is brown; front and hind femora thickened in both sexes, and their coxae and trochanters a little elongated. Length 1.8 mm.

Types, one male (holotype), one female, mounted on same pin, from Franconia, New Hampshire, collected by Mrs. Slosson and in her possession. *Paratypes*, one each from Pullman, Lyndon and Almota, Washington, and one from Moscow Mountain, Idaho, all collected by Professor Melander. Paratype from Washington deposited in the United States National Museum.

Leiomyza melanderi n. sp. (Text Fig. 1, wing).

Smaller than *slossonae* (1.5 mm.), all the femora slender; legs pale yellow, last tarsal joint almost black. Face not usually so whitish, more yellow. The specimen from Montreal has the head darker, front blackish-brown, with a faint median paler streak, lower edge pale



Text Fig. 1.—*Leiomyza melanderi* n. sp. Right wing, under side. × 46.

yellow, face and bucca quite dark yellow, third antennal joint about half infuscated. This I can only regard as a dark form of the same species, although the front looks different.

Types, one male, one female, Moscow Mountain, Idaho; *paratypes,* one each from Moscow Mountain, Idaho; Pullman, Olga, Everett and Almota, Washington; all the preceding collected by Professor Melander, in whose possession the types remain. Also one female paratype from Montreal, Canada, collected by Rev. Jos. Ouellet. Two paratypes from Washington in the United States National Museum.

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The Staining of Coccids (Homop.).*

By J. Howard Gage.

Students of the Coccidae have long desired a stain that would permanently color the chitinous exoskeleton and at the same time give enough contrast to make the more minute details of structure plainly visible under the microscope. Until the present time such a stain has not been found. In most cases in specimens that have been stained the color disintegrates with age, leaving them muddy, and in fact, in a much worse condition for study than they would have been had no stain been used.

In my work with the Coccidae several of the more common stains were tried, one by one they were discarded until only säurefuchsin remained. This substance gave on the whole the best results, but even in specimens colored with this stain the color faded after a time. Säurefuchsin is, as the name implies, an acid stain having enough acid combined with the coloring properties of the substance to produce acidity, providing the specimen treated is neutral or acid. It is evident, then, that the presence of an alkali even in minute quantities will impair the working of the stain, for such an alkali would neutralize the acid of the stain and cause it to break down. To remove all traces of the potassium hydroxide ordinarily used in cleaning specimens requires more than the customary three or four baths of distilled water; in fact one can never, according to the theory of limits, remove all of the alkali simply by washing, even though one might reduce it to a negligible quantity. In order to prevent any alkali being present, a ten per cent. solution of hydrochloric acid was added to the staining solution. This excess of acid neutralized the small amount of potassium hydroxide that remained, precipitating it as a potassium salt, leaving an excess of hydrochloric acid in the staining solution and the specimen,

$$HCl \text{ (in excess)} + KOH = KCl + HOH + HCl.$$

The precipitated potassium chloride is very highly soluble in water, but since all of the water is removed during the dehydration of the specimen there remains nothing except a few crystals of potassium chloride and hydrochloric acid in excess. As there is an excess of acid in the specimen, it is clear that if it be mounted and sealed in with acid balsam it will

*Contributions from the Entomological Laboratories of the University of Illinois. No. 59.

remain an acid preparation and its color will not disintegrate.

A check series of experiments was carried out to determine the action of alkali on the stain. In this series the staining bath was made strongly alkaline by the addition of potassium hydroxide. The results of the experiments show, conclusively, that the presence of an alkali does cause the color of the stain to disintegrate. In fact, when the specimens were removed from the staining solution all of the color had faded from the bath itself and the specimens showed no color whatsoever.

Various strengths of staining solutions were tried in a careful and somewhat extended series of experiments. In this series species of coccids with a thin cuticle, those with a medium heavy cuticle, and those with a heavy cuticle were used. As a result of these experiments it was found that the following formula produced the best coloring in all of the species tried:

Säurefuchsin	0.5	gram
10 per cent. hydrochloric acid	25.0	cc.
Distilled water	300.0	cc.

The above formula is recommended as a solution of a stain that will produce a permanent and successful color in the Coccidae and their near relatives in thirty to forty minutes. It can be kept indefinitely in a glass-stoppered bottle and used whenever there is an occasion.

Specimens to be stained should be removed from the potassium hydroxide and thoroughly washed in three or four changes of distilled water, then placed in a Syracuse watch-glass containing a few cubic centimeters of the staining solution for twenty or forty minutes. After the staining is completed, they should be removed and treated in the manner usually followed in making preparations of coccids. Säurefuchsin is not highly soluble in either carbol-xylene, clove oil, or alcohol, therefore, the specimens may be left in solutions of these substances a sufficient length of time to insure complete clearing and dehydration.

The explanation of the so-called fading of color in stained coccids is that they are probably alkaline, and if the specimens are made acid, that is to have an excess of acid present, they will not become muddy or colorless. Specimens that were stained, using this formula, in the winter of 1915, are at the present time as brightly colored and show as much contrast as they did when freshly prepared, while specimens stained at the same time using a neutral solution, or one that did not contain an excess of acid, have become almost colorless.

ENTOMOLOGICAL NEWS.

PHILADELPHIA, PA., MAY, 1919.

Entomologia Resurgens Belgica.

The American Entomological Society has lately received in exchange Number 1 of the Nineteenth Year of the *Revue Mensuelle de la Société Entomologique Namuroise,* dated Namur (Belgium), Jan. 25, 1919. The opening paragraphs are as follows (translated):

After 53 months of silence, our review reappears; at first under a modest aspect that we will seek to improve in order to give it as rapidly as possible all its old vitality. We appeal for the aid of all our friends; during the long months of desolation, entomology has been a consolation and we count on an ample harvest of notes and interesting observations, continuing to give to our review that personal character which has made it so valuable. It does not enter into our plan to speak of the war; our beautiful patriotic song, "To The Future," ought to be our guide; it will inspire us and will show us our path; with the help of God we do not doubt of success. Our Society has decided to break off all relations with the German countries and their allies. The barbarism, of which we have been the victims, approved by their savants (?), has made this purification necessary. Andenne, Dinant, Tamines, Louvain, Rheims and how many other cities and villages are not scraps of paper which a Chancellor can ever make disappear.

Let us by a League of Nations, or by any other means, and by all means prevent a repetition of the horrors which have compelled our Belgian confrères to write these words.

An Itonid Feeding on Rust Spores (Itonididae, Diptera).

During the summer of 1918 some interesting itonid larvae were found living in hypertrophied fruits of *Crataegus* at Ithaca, New York. The adults, when bred from the fruit, were sent to Dr. Felt for identification. He found them to be *Mycodiplosis cerasifolia* Felt. This species was first reared September 4, 1907, from irregularly thickened folded choke cherry leaves taken at Newfoundland, New Jersey, and described by Dr. Felt in "New Species of Cecidomyiidae II," p. 21, 1907. A figure of the gall produced on choke cherry leaves is given in Thompson's Illustrated Catalog of American Insect Galls (plate 8, figure 327) and this is reproduced in New York State Museum Bulletin 200 (plate 11, figure 4) by Dr. Felt.

The infested fruits of *Crataegus* on examination were found to have a fungous disease called Crataegus rust or quince rust, *Gymnosporangium clavipes* C. and P. According to Weimer (Cornell University Bull. 390) this disease is widely distributed in the eastern and central

United States and is sometimes of considerable economic importance on the quince. It attacks fruit, leaf petioles, stems and thorns of *Crataegus*, causing rough enlargements from which the long finger-like aecia begin to break out the last of July or first of August. The peridium or spore sac which covers the aecium is white and is filled with a mass of orange-colored aeciospores.

These itonid larvae live among the aeciospores and feed upon them. Larvae collected August 1 were washed in alcohol to remove the spores adhering to their moist cuticula and examined under the microscope. The alimentary canal was found to be filled with the orange-colored spores, and these caused the larvae to appear orange. The larva is 1.85 mm. long and 0.35 mm. broad at the middle when full grown. It does not show the characteristic "breast bone" so commonly seen on the larvae of this family.

When infested fruit was placed on moist sand the larvae transformed to adults on the surface of the sand and when infested fruit was placed in a tin box with no earth or sand the larvae transformed on the bottom of the box. This seems to indicate that under natural conditions the larvae go to the surface of the ground to pupate. Larvae which were brought into the laboratory August 1 left the fruit within two days and emerged as adults August 12. Other larvae were found feeding on the spores in the field September 6 and October 1, so that there are probably several generations a year. The insects are not present in the hypertrophied fruits during the winter, so it seems probable that they hibernate as pupae on the ground.

The swellings due to this rust were found quite often at the bases of the thorns as well as on the fruit, and every one examined contained larvae. They were never found within the fruit or thorn itself, but always in the fungus. They were found on *Crataegus neofluvialis*, *C. punctata*, *C. macracantha*, *C. pruinosa* and *C. tomentosa*. The red cedar *Juniperus virginiana* is the alternate host of the rust and *Crataegus* trees near a red cedar are more liable to be infected than those farther from it.—WALTER H. WELLHOUSE, Dept. of Entomology, Cornell University, Ithaca, New York.

Entomological Literature.

COMPILED BY E. T. CRESSON, JR., AND J. A. G. REHN.

Under the above head it is intended to note papers received at the Academy of Natural Sciences, of Philadelphia, pertaining to the Entomology of the Americas (North and South), including Arachnida and Myriopoda. Articles irrelevant to American entomology will not be noted; but contributions to anatomy, physiology and embryology of insects, however, whether relating to American or exotic species, will be recorded.

The numbers in **Heavy-Faced Type** refer to the journals, as numbered in the following list, in which the papers are published.

All continued papers, with few exceptions, are recorded only at their first installments.

The records of papers containing new genera or species occurring north of Mexico are all grouped at the end of each Order of which they treat.

For records of Economic Literature, see the Experiment Station Record, Office of Experiment Stations, Washington. Also Review of Applied Entomology, Series A. London. For records of papers on Medical Entomology, see Review of Applied Entomology, Series B.

4—Canadian Entomologist, London, Canada. **5**—Psyche, Cambridge, Mass. **9**—The Entomologist, London. **10**—Proceedings of the Entomological Society of Washington, D. C. **11**—Annals and Magazine of Natural History, London. **15**—Insecutor Insci-

tiae Menstruus, Washington, D. C. **16**—The Lepidopterist, Salem, Mass. **17**—Lepidoptera, Boston, Mass. **18**—Ottawa Naturalist, Ottawa, Can. **24**—Annales de la Societe Entomologique de France, Paris. **25**—Bulletino della Societa Entomologica Italiana, Firenze. **28**—Entomologisk Tidskrift, Uppsala. **29**—Proceedings of the Linnean Society of New South Wales, Sydney. **52**—Zoologischer Anzeiger, Leipsic. **76**—Nature, London. **82**—The Ohio Journal of Science, Columbus. **89**—Zoologische Jahrbucher, Jena. **90**—The American Naturalist, Lancaster, Pa. **91**—The Scientific Monthly, Lancaster, Pa. **92**—Archives de Zoologie Experimentale et Generale, Paris. **93**—Bulletin, Division of the Natural History Survey, Urbana, Illinois.

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PHYSIOLOGY, GENETICS, ETC. Nabours, R. K.—Parthenogenesis and crossing-over in the grouse locust, Apotettix. **90,** liii, 131-42.

ARACHNIDA AND MYRIAPODA. Brade-Birks, H. K. & S. G.—Notes on Myriapoda: Some observations on nomenclature. **11,** iii, 253-6. **Dalmas, C.**—Synopsis des araignees de la famille des Prodidomidae. **24,** lxxxvii, 279-288 (cont.). **Muller, A.**—Ein beitrag zur kenntnis der weibchen der subfamilie Phalangiini. **89,** xli, Ab. f. Syst., 535-80. **Patten, B. M.**—Photoreactions of partially blinded whip-tail scorpions. (Jour. Gen. Physiology, Baltimore, i, 435-58.).

NEUROPTERA. Whitehouse, F. C.—Dragonflies of Alberta (with descriptive notes as a means to identification). (Alberta Nat. Hist. Soc., Red Deer, 16 pp.).

ORTHOPTERA. Morse, A. P.—New records of O. in New England. **5,** xxvi, 16-18.

Giglio-Tos, E.—Mantidi esotici. **25,** xlviii, 43-108.

HEMIPTERA. Parshley, H. M.—New England Hemiptera-Heteroptera, new records. **4,** 1919, 70-2. **Tullgren, A.**—Zur morphologie und systematik der Hemipteren, I. **28,** xxxix, 113-33.

LEPIDOPTERA. Buckholtz, O.—On the larvae of Datana chirignensis. **16,** iii, 102. **Dean, F. R.**—Catocala season of 1918 in St. Louis County, Missouri. **17,** iii, 18-19. **Dognin, P.**—Heteroceres nouveaux de l'Amerique du Sud. Fasc. xvi, xv. **Dyar, H. G.**—Some Tropical American Phycitinae. Some Tropical American moths. **15,** vii, 40-63; 74-85. **Ellsworth, A.**—Butterfly names. **17,** iii, 19-21. **Hampson, G. F.**—Descriptions of new Pyralidae of the subfamilies Crambinae and Siginae [some neotropical]. **11,** iii, 275-92 (cont.). **Hufnagel, A.**—Recherches histologiques sur la metamorphose d'un lepidoptere (Hyponomenta padella). **92,** lvii, 47-202. **Walker, F. H.**—Synchronous movements in Vanessa antiopa larvae, with notes on the attractions of certain male L. by the females of their own species. **5,** xxvi, 13-16.

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HYMENOPTERA. Lovell, J. H.—The flower and the bee. Plant life and pollination. (New York. Charles Scribner's Sons, 1918.). **Wheeler, W. M.**—Two gynandromorphous ants. **5,** xxvi, 1-9. **Wolff, M.**—Proctotrupiden-gattung Lagynodes. **89,** xli, Abt. f. Syst., 581-606.

"The Wings of Insects," by J. H. Comstock, Emeritus Professor of Entomology and General Invertebrate Zoology in Cornell University. 4to, pp. XVIII.+430, plates i-x, figs. 1-427, and Bibliography. Published by the Comstock Publishing Co., Ithaca, N. Y. Price $3.75.

This fine volume marks the completion of the edifice which has been its author's life's work, viz., the study of the wings, and in particular the wing-venation, of insects. Though there are still some conservative entomologists who refuse to accept the Comstock-Needham system of notation for the wing-veins of insects, their number must be rapidly decreasing, and the system is indispensable to any student who would work beyond the limits of a single order.

Amongst the many fine chapters in this book, the author himself would probably be the first to acknowledge that the most important is that on the basal connections of the tracheae of the wings, by R. N. Chapman, M.A.—a quite original piece of work which stamps its author as one of the finest entomological dissectors of the age. Originally the study of these basal connections, as well as of the specializations at the bases of the veins themselves, was greatly neglected. In the present volume, a great advance has been made in overcoming this; but it is evident that much more remains to be done, and we must not accept this book as in any way the final decision on many important points. It is, perhaps, especially to be regretted that the author should have attempted to fix a single type of venation, with a definite number of branches, as the original possession of the first insects; for any student of the Palaeozoic fossils can only come to the conclusion that there was nothing more variable from the very first, than the number of branches of each of the main veins. In working from this type, and so determining every known type of venation in terms of it, the author falls into some grave errors of which, perhaps, the most serious is the determination to keep the cubitus two-branched in the Lepidoptera, the extra basal branch being explained as the first analis migrated over to join the cubitus. By this, the obvious homologies of the cubital branches in the Lepidoptera, with those of the older Megaloptera, Mecoptera and Planipennia, are entirely lost sight of.

The removal of the *Micropterygidae* from the Lepidoptera to the Trichoptera is the most drastic change from accepted classification proposed in the book. It is a good example of the kind of conclusion that can sometimes be reached by considering only one set of characters, and ignoring all the rest. But even from the point of view of wing-venation it is scarcely defensible, for a careful study of the freshly turned pupae of any of the older families of Lepidoptera will show that their wing-tracheation agrees closely with that of *Micropteryx*, particularly in the different courses of Cu and 1A in fore and hind wings. Moreover, the pupal wing of *Micropteryx* has a complete trache-

ation; the imaginal wings have broad, well developed scales of a higher type than any found in the Trichoptera; the forewing does not possess a separate M4; and the hind wing has a definite frenulum. In all these points this family is definitely Lepidopterous. Neither the larval form nor the imaginal mouth-parts are Trichopterous, so that there is really no justification for so radical a change, which must remain as a serious blemish in a fine work.

The most complete and detailed chapter is that upon the wings of the Neuroptera, in which much splendid original work is displayed. But here, more than anywhere else, the mistake of trying to work back to the supposed ancestral type is most evident, and a reference to the known Triassic and Liassic fossils, almost all of which are closely and densely veined, should have convinced the author that his theory was wrong in detail. Consequently, we have the statement made that *Hemerobius* is an archaic genus and *Megalomus* highly specialized, whereas the reverse is certainly the case; the Mantispidae are dealt with quite "in the air," instead of with their close allies, the Chrysopidae and Berothidae; and the Apochrysidae likewise.

In contrast with this, the painstaking working-out of the heteroneurism in the Myrmeleontoid families, without the aid of the pupal tracheation of the older families, is worthy of the highest praise; more recent studies of these pupae in Australia show Comstock's work to be correct in almost every particular.

There is one striking omission in the book, viz., the neglect to utilize the wing-trichiation as an aid to homologies. The importance of this cannot be over-estimated, especially in those orders in which the pupal tracheation fails, as in the Mecoptera, Trichoptera and Diptera. This failure accounts for two serious errors, viz., the interpretation of the limits of the media and cubitus in *Merope* and also in *Rhyphus* (and consequently in all Diptera). In both cases, an oblique vein carrying strong macrotrichia has been interpreted as a cross-vein, when, as a matter of fact, it is the basal piece of a branch of a main vein.

It should be noted that the author tacitly throws overboard the untenable "Meyrick's Law," which he espoused and christened in a much earlier work. Nearly all the original work in this book is a witness of the fallacy of this supposed "law." But perhaps it would have been better to have stated definitely the author's changed conception. It is harder to explain the failure of the author to deal with the unbranched radius theory in the Order Odonata; whether he agrees with it or not, he should surely not have ignored it completely, as he has done.

But when all these criticisms have been made, it remains to be said that the book is a magnificent piece of work, and well worthy of the labor that its talented author has spent upon it. To all entomologists

who would progress beyond the general level of stagnation, this book should be an absolute necessity; and the more of them who "read, mark, learn and inwardly digest" its contents, the better it will be for the future progress of Entomology.

The general appearance of the book could not be improved upon, the type being very clear, and the plates and text-figures as fine as we have seen. Only those who know the great difficulty involved in producing even only a moderately good photograph of a delicate wing-tracheation, can really appreciate the immense amount of skilled labor that must have gone to the making of the illustrations in this book. Plate 1 is a perfect masterpiece of technical art.—R. J. TILLYARD.

Doings of Societies.

American Entomological Society.

Stated and annual meeting, December 9, 1918, in the hall of the Academy of Natural Sciences of Philadelphia. Vice President J. A. G. Rehn in the chair; fifteen persons present. The annual reports were read. The Publication Committee reported that Volume 44 of the *Transactions* had been completed, but that the *Memoirs* for 1918 had been delayed by war conditions. The death of Mr. Benjamin Hayes Smith, a member of long standing, was announced, together with the fact that his collection of Coleoptera had been given by him to the University of Pennsylvania some months previous to his death.

The meeting then proceeded to ballot for officers and committees for the year 1919, resulting in the following elections: President—Henry Skinner, Vice-President—J. A. G. Rehn, Corres. Sec'y—Morgan Hebard, Recording Sec'y—Geo. M. Greene, Treasurer—E. T. Cresson. Publication Committee—J. A. G. Rehn, E. T. Cresson, P. P. Calvert. Finance Committee, J. A. G. Rehn, D. M. Castle, Morgan Hebard. Property Committee—E. T. Cresson Jr., Morgan Hebard, Philip Laurent.—Capt. R. C. WILLIAMS, *Recording Secretary.*

Feldman Collecting Social.

Meeting of February 19, 1919, at the home of H. W. Wenzel, 5614 Stewart St., Philadelphia; six members present. Pres. H. W. Wenzel in the chair.

Coleoptera. Mr. Wenzel recorded, for J. Wagener Green, the finding of *Phyllotreta armoraciae* Koch at Easton, Pennsylvania, and read Chittenden's account from *Insect Life*, vii, p. 404, 1895, of the first record of this "horse-radish flea-beetle" found within a quarter of a mile of the Columbian Exposition Grounds at Chicago, Illinois. He exhibited his own specimens, which are from Okanchee, Wisconsin. General discussion followed.—GEO. M. GREENE, *Sec'y.*

EXCHANGES.

This column is intended only for wants and exchanges, not for advertisements of goods for sale. Notices not exceeding three lines free to subscribers.

☞ These notices are continued as long as our limited space will allow; the new ones are added at the end of the column, and only when necessary those at the top (being longest in) are discontinued.

Will pay cash for Pars 39 and 52: Coleopterorum Catalogus, of Junk. Jos. O. Beaulne, 3653 Notre Dame East, Montreal, Canada.

Wanted—Living and preserved material of Tabanid and other dipterous larvae and pupae. Tabanid larvae obtained by sifting soil at edge of ponds and streams. Packing in wet material, not water, each larva separate, in glass vials or tins. To preserve use boiling water, then alcohol. Exchange: Insects of all orders, or cash. Werner Marchand, 10 Dickinson St., Princeton, N. J.

Live Pupae of Sph. chersis, drupiferarum, luscitiosa, eremitus, Phil. achemon, Deid. inscripta, Paon. excaecatus, myops, Eac. imperialis, Cres. juglandis and others for exchange. Wanted—N. A. and Exotic Lepidoptera. Will pay cash for N. A. Catocalas. Herman J. Erb, 925 Hatch Ave., Woodhaven, Lg. Isl., New York.

Wanted for Cash or Exchange—Exotic Lycaenidae and some species from the U. S. Send me your offerta and lowest cash price. Paul N. Musgrave, 130 Oak Street, Clarksburg, W. Va.

Wanted—Syrphidae, Bombylidae and Coccinellidae from all parts of the world in exchange; also Florida insects for those from other regions. P. W. Fattig, Box 315, Gainesville, Fla.

Wanted—Phanaeus, Moneilema and Cleridae for cash or liberal exchange in rarities. Please send your lists to F. J. Psota, 316 So. Mozart St., Chicago.

Diurnal Lepidoptera—I have many desirable western species to exchange. Send lists of offerta. Dr. John Comstock, Southwest Museum, Marmion Way and Ave. 46, Los Angeles, Calif.

Certain Odonata Wanted.—The undersigned desires to examine Gomphus dilatatus and Enallagma pollutum from Florida and nearby States and will much appreciate a loan of such specimens. Please write before sending.—Philip P. Calvert, Zoological Lab'y., University of Pa., Philadelphia, Pa.

Wanted—Species of Dytiscidae, Haliplidae, Gyrinidae and Hydrophilidae, either for exchange or cash. Please send lists. Dr. Geo. W. Bock, 2904 Allen Ave., St. Louis, Mo.

Pentatomidae.—Would like to purchase North American material in this family of Hemiptera. G. Chagnon, P. O. Box 521, Montreal, Canada.

Wanted for Cash—Synopsis of the Erotylidae, by G. R. Crotch, Wm. Beutenmuller, 879 Whitlock Avenue, Bronx, New York, N. Y.

Wanted—Specimens of fleshy and woody fungi from which beetles have been collected, together with names of host trees, names of beetles, localities and dates. All specimens will be gratefully acknowledged and identified, and the information properly accredited. Harry B. Weiss, State Department of Agriculture, Trenton, N. J.

Wanted—Tinulidae from all parts of North America. Material from the far North especially desired. Will buy or exchange. Dr. W. G. Dietz, 21 North Vine Street, Hazleton, Pa.

Aradus.—I am engaged on a review of the North American species of this Hemipterous genus and shall be glad to examine specimens from any part of the continent. Determinations in return for specimens needed in my work.—H. M. PARSHLEY, Smith College, Northampton, Mass.

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